

CLAIMS

What is claimed is:

- 1 1. A method for preparing organoclays comprising the steps of:
2 (a) dispersing a clay in an aqueous solution comprising a polymeric
3 hydrotrope;
4 (b) adsorbing sub-monomolecular layer of the polymeric hydrotrope on the
5 clay; and
6 (c) adsorbing an HLB modifying surfactant on the clay.

1 2. The method of Claim 1 wherein the polymeric hydrotrope is a water
2 soluble polymer selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone,
3 polyethylene glycol, polypropylene glycol, polybutylene glycol, methoxypolyethylene glycol,
4 dimethoxypolyethylene glycol, polyethylene glycol derivatives, copolymers of polyethylene
5 glycol and polypropylene glycol, and copolymers of polyethylene glycol, polybutylene glycol
6 and combinations thereof.

1 3. The method of Claim 1 wherein the polymeric hydrotrope is a water
2 soluble polymer comprising a polyethylene glycol derivative selected from the group consisting
3 of polyethylene glycol acrylate, polyethylene glycol diacrylate, polyethylene glycol methyl ether
4 acrylate, polyethylene glycol methacrylate, polyethylene glycol dimethacrylate, polyethylene
5 glycol methyl ether methacrylate, polyethylene glycol methyl ether epoxide, polyethylene glycol
6 diglycidyl ether, polyethylene glycol phenyl ether acrylate, polyethylene glycol bisphenol A
7 diglycidyl ether, polyethylene glycol dibenzoate, polyethylene glycol bis(3-aminopropyl ether),
8 polyethylene glycol butyl ether, polyethylene glycol dicarboxymethyl ether, polyethylene glycol
9 divinyl ether.

1 4. The method of Claim 1, wherein the polymeric hydrotrope is a polymer
2 having limited water solubility selected from the group consisting of polyethylene glycol-*block*-
3 polypropylene glycol-*block*-polyethylene glycol, polyethylene glycol-*ran*-polypropylene glycol,

4 polyethylene glycol-*ran*-polypropylene glycol monobutyl ether, polypropylene glycol-*block*-
5 polyethylene glycol-*block*-polypropylene glycol, polypropylene glycol monobutyl ether,
6 polytetrahydrofuran, polytetrahydrofuran bis(3-aminopropyl), polyethylene-*block*-polyethylene
7 glycol, polypropylene glycol, and combinations thereof.

1 5. The method of Claim 1 wherein the polymeric hydrotrope is adsorbed
2 onto the clay prior to adsorbing the HLB modifying surfactant on the surface of the clay.

1 6. The method of Claim 1 wherein the clay is exposed to a solution
2 containing both the polymeric hydrotrope and the HLB modifying surfactant, such that
3 adsorption of the surfactant to the clay and adsorption of the hydrotrope on the clay occur
4 substantially simultaneously.

1 7. The method of Claim 1 wherein the HLB modifying surfactant is selected
2 from the group consisting of surfactants of the amine salt-type, phosphonium salt-type, and
3 sulfonium salt-type.

1 8. The method of Claim 1 wherein the HLB modifying surfactant is a
2 quaternary ammonium ion.

1 9. The method of Claim 1 wherein the organoclay has a polymeric
2 hydrotrope loading of less than about 15 weight percent.

1 10. The method of Claim 1 further comprising the steps of drying the
2 organoclay and blending the dried organoclay with a swelling agent selected from natural and
3 synthetic waxes.

1 11. The method of Claim 10 wherein the amount of swelling agent blended
2 with the dried organoclay is between about 10 and about 30 weight percent relative to the weight
3 of the organoclay.

1 12. The method of Claim 10 wherein the swelling agent is a natural wax
2 selected from the group consisting of paraffin, microcrystalline montan, and vegetable waxes.

1 13. The method of Claim 10 wherein the swelling agent is a synthetic wax
2 selected from the group consisting of Fisher-Tropsch, polyethylene, polypropylene,
3 ethylene/propylene copolymers, polymethylene, chemically modified waxes, polymerized alpha-
4 olefins, and combinations thereof.

1 14. A method for preparing organoclays comprising:
2 (a) dispersing a clay in an aqueous solution comprising a polymeric
3 hydrotrope;
4 (b) adsorbing from about 0.1 to about 15 percent by weight, relative to the
5 weight of the clay, of the polymeric hydrotrope on the clay; and
6 (c) adsorbing a HLB modifying surfactant on the clay.

15 15. The method of Claim 14 wherein the polymeric hydrotrope is adsorbed in
16 an amount between about 1 and about 10 percent by weight, relative to the weight of the clay.

1 16. The method of Claim 14 wherein the polymeric hydrotrope is a water
2 soluble polymer selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone,
3 polyethylene glycol, polypropylene glycol, polybutylene glycol, methoxypolyethylene glycol,
4 dimethoxypolyethylene glycol, polyethylene glycol derivatives, copolymers of polyethylene
5 glycol and polypropylene glycol, and copolymers of polyethylene glycol, polybutylene glycol
6 and combinations thereof.

1 17. The method of Claim 14 wherein the polymeric hydrotrope is a water
2 soluble polymer comprising a polyethylene glycol derivative selected from the group consisting
3 of polyethylene glycol acrylate, polyethylene glycol diacrylate, polyethylene glycol methyl ether
4 acrylate, polyethylene glycol methacrylate, polyethylene glycol dimethacrylate, polyethylene
5 glycol methyl ether methacrylate, polyethylene glycol methyl ether epoxide, polyethylene glycol
6 diglycidyl ether, polyethylene glycol phenyl ether acrylate, polyethylene glycol bisphenol A
7 diglycidyl ether, polyethylene glycol dibenzoate, polyethylene glycol bis(3-aminopropyl ether),
8 polyethylene glycol butyl ether, polyethylene glycol dicarboxymethyl ether, polyethylene glycol
9 divinyl ether.

1 18. The method of Claim 14 wherein the polymeric hydrotrope is a polymer
2 having limited water solubility selected from the group consisting of polyethylene glycol-*block*-
3 polypropylene glycol-*block*-polyethylene glycol, polyethylene glycol-*ran*-polypropylene glycol,
4 polyethylene glycol-*ran*-polypropylene glycol monobutyl ether, polypropylene glycol-*block*-
5 polyethylene glycol-*block*-polypropylene glycol, polypropylene glycol monobutyl ether,
6 polytetrahydrofuran, polytetrahydrofuran bis(3-aminopropyl), polyethylene-*block*-polyethylene
7 glycol, polypropylene glycol, and combinations thereof.

1 19. The method of Claim 14 wherein the polymeric hydrotrope is adsorbed
2 onto the clay prior to adsorbing the HLB modifying surfactant on the surface of the clay.

1 20. The method of Claim 14 wherein the clay is exposed to a solution
2 containing both the polymeric hydrotrope and the HLB modifying surfactant, such that
3 adsorption of the surfactant to the clay and adsorption of the hydrotrope on the clay occur
4 substantially simultaneously.

1 21. The method of Claim 14 wherein the HLB modifying surfactant is
2 selected from the group consisting of surfactants of the amine salt-type, phosphonium salt-type,
3 and sulfonium salt-type surfactants.

1 22. The method of Claim 14 wherein the HLB modifying surfactant is a
2 quaternary ammonium ion.

1 23. The method of Claim 14 further comprising the steps of drying the
2 organoclay and blending the dried organoclay with a swelling agent selected from natural and
3 synthetic waxes.

1 24. The method of Claim 23 wherein the amount of swelling agent blended
2 with the dried organoclay is between about 10 and about 30 weight percent relative to the weight
3 of the clay.

1 25. The method of Claim 23 wherein the swelling agent is a natural wax
2 selected from the group consisting of paraffin, microcrystalline montan, and vegetable waxes.

1 26. The method of Claim 23 wherein the swelling agent is a synthetic wax
2 selected from the group consisting of Fisher-Tropsch, polyethylene, polypropylene,
3 ethylene/propylene copolymers, polymethylene, chemically modified waxes, polymerized alpha-
4 olefins, and combinations thereof.

1 27. A method for preparing organoclays comprising:
2 (a) mixing a clay with a polymeric hydrotrope and an HLB modifying
3 surfactant;
4 (b) adsorbing from about 0.1 to about 15 percent by weight, relative to the
5 weight of the clay, of the polymeric hydrotrope on the clay; and
6 (c) adsorbing the HLB modifying surfactant on the clay.

7 28. The method of Claim 27 wherein the polymeric hydrotrope is adsorbed in
8 an amount between about 1 and about 10 percent by weight, relative to the weight of the clay.

9 29. The method of Claim 27 wherein the polymeric hydrotrope is a water
10 soluble polymer selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone,
11 polyethylene glycol, polypropylene glycol, polybutylene glycol, methoxypolyethylene glycol,
12 dimethoxypolyethylene glycol, polyethylene glycol derivatives, copolymers of polyethylene
13 glycol and polypropylene glycol, and copolymers of polyethylene glycol, polybutylene glycol
14 and combinations thereof.

15 30. The method of Claim 27 wherein the polymeric hydrotrope is a water
16 soluble polymer comprising a polyethylene glycol derivative selected from the group consisting
17 of polyethylene glycol acrylate, polyethylene glycol diacrylate, polyethylene glycol methyl ether
18 acrylate, polyethylene glycol methacrylate, polyethylene glycol dimethacrylate, polyethylene
19 glycol methyl ether methacrylate, polyethylene glycol methyl ether epoxide, polyethylene glycol
20 diglycidyl ether, polyethylene glycol phenyl ether acrylate, polyethylene glycol bisphenol A
21 diglycidyl ether, polyethylene glycol dibenzoate, polyethylene glycol bis(3-aminopropyl ether),
22 polyethylene glycol butyl ether, polyethylene glycol dicarboxymethyl ether, polyethylene glycol
23 divinyl ether.

1 31. The method of Claim 27 wherein the polymeric hydrotrope is a polymer
2 having limited water solubility selected from the group consisting of polyethylene glycol-*block*-
3 polypropylene glycol-*block*-polyethylene glycol, polyethylene glycol-*ran*-polypropylene glycol,
4 polyethylene glycol-*ran*-polypropylene glycol monobutyl ether, polypropylene glycol-*block*-
5 polyethylene glycol-*block*-polypropylene glycol, polypropylene glycol monobutyl ether,
6 polytetrahydrofuran, polytetrahydrofuran bis(3-aminopropyl), polyethylene-*block*-polyethylene
7 glycol, polypropylene glycol, and combinations thereof.

1 32. The method of Claim 27 wherein the polymeric hydrotrope is adsorbed
onto the clay prior to adsorbing the HLB modifying surfactant on the surface of the clay.

1 33. The method of Claim 27 wherein the clay is exposed to a mixture
containing both the polymeric hydrotrope and the HLB modifying surfactant, such that
adsorption of the surfactant to the clay and adsorption of the hydrotrope on the clay occur
substantially simultaneously.

1 34. The method of Claim 27 wherein the HLB modifying surfactant is
selected from the group consisting of surfactants of the amine salt-type, phosphonium salt-type,
and sulfonium salt-type surfactants.

1 35. The method of Claim 27 wherein the HLB modifying surfactant is a
2 quaternary ammonium ion.

1 36. The method of Claim 37 further comprising the step of blending the
2 organoclay with a swelling agent selected from natural and synthetic waxes.

1 37. The method of Claim 36 wherein the amount of swelling agent blended
2 with the organoclay is between about 10 and about 30 weight percent relative to the weight of
3 the clay.

1 38. The method of Claim 36 wherein the swelling agent is a natural wax
2 selected from the group consisting of paraffin, microcrystalline montan, and vegetable waxes.

1 39. The method of Claim 36 wherein the swelling agent is a synthetic wax
2 selected from the group consisting of Fisher-Tropsch, polyethylene, polypropylene,
3 ethylene/propylene copolymers, polymethylene, chemically modified waxes, polymerized alpha-
4 olefins, and combinations thereof.

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